93. Penaeid Crustaceans with the Asymmetrical Petasma.

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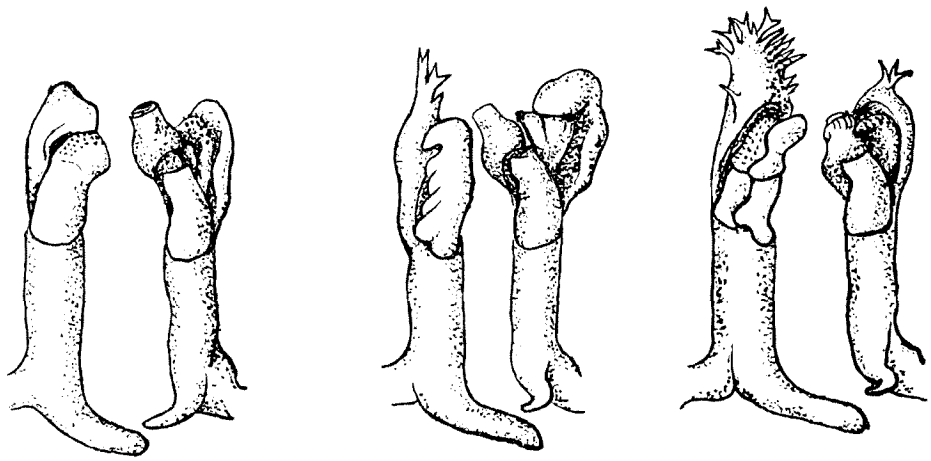
Up to the present comprised in the genus *Penaeopsis* are *Penaeopsis monoceros* and its allies, having the symmetrical petasma, as well as the prawns with the asymmetrical petasma, chiefly on account of the same arrangement of the branchial organs. To my mind, however, this appears not tenable, because these two groups of prawns differ from each other in many other important structures. On the other hand, ALCOCK, DE MAN, BALSS, SCHMITT, and others subdivide the species of *Penaeopsis* into two sections on the basis of the absence or presence of lateral marginal spines on the telson; but this classification also appears to me not valid.

In the group of *Penaeopsis monoceros* and its allies, with the symmetrical petasma, we find two joints in the endopodite of the first maxilla, no exopodite to the last pair of pereiopods, and the receptaculum seminis divided into two cavities by a median septum. In the prawns with the asymmetrical petasma, on the contrary, there can be seen only one joint in the endopodite of the first maxilla, the exopodite present on the last pair of pereiopods, and the receptaculum seminis is separated into two distinct sacs. Under such circumstances, I feel it better to restrict the genus *Penaeopsis* to the group of *Penaeopsis monoceros* and its allies, setting aside the prawns with the asymmetrical petasma.

In the prawns with the asymmetrical petasma, the antero-inferior corner of the carapace ends in a tooth. The dorsal median carina is well developed in the pleon, being found to extend back from the second pereionic somite, and in the third somite it is especially marked. The tergites of the first and second pleonic somites are more or less indented posteriorly, so that the prawns of this group are capable of raising the anterior part of their body. The presence of a pair of long spines between the second pereiopods and a pair of small knobs between the third pereiopods is also characteristic to this group of prawns. The telson is nearly as long as the sixth pleopods, and it is armed with three pairs of movable spines and a pair of fixed spines on lateral margin. Thus I see that this group is a quite natural assemblage.

The asymmetrical petasma is very complicated. The left lobe is longer than the right, especially at the posterior end. Each lateral lobe of the petasma is divided into anterior and posterior halves, and the

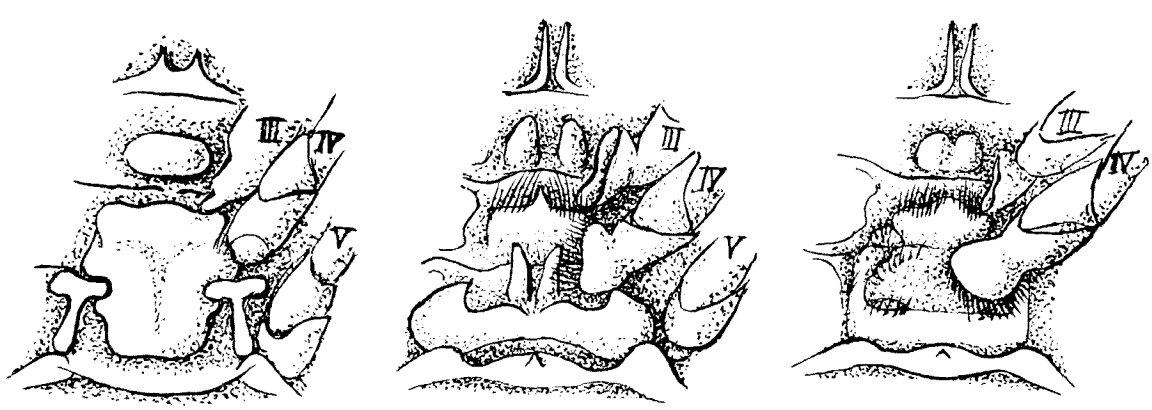
anterior half is subdivided longitudinally into external and internal pieces. The external piece is slenderly stalked and protect the internal piece. The left internal piece is again separated transversely, or transversely



Dorsal view of the petasma, right and left lobes separated.
Leptopenaeus philippinensis. Ceratopenaeus mogiensis. Erythropenaeus akayebi.

as well as longitudinally, and these components lie nearly in the same plane. In the right internal piece, which is twisted sinistrally at the anterior external corner, we find always one proximal and two distal parts. Of the latter, one is elastic, convoluted counterclockwise, and occupies a position in the anterior median portion of the petasma. The elastic part seems to perform an important function in transferring the spermatophore to the female.

In the Penaeidae the thelycum is formed in the sternites of the fourth and fifth pereionic somites, the receptaculum seminis being found in a groove or grooves between these somites, and behind the genital pores. In the prawns with the asymmetrical petasma, there is generally a large median plate between the fourth pereiopods, which is in most



Ventral view of pereionic sternites to shown the thelycum.
Leptopenaeus philippinensis. Ceratopenaeus mogiensis. Erythropenaeus akayebi.

cases raised anteriorly. The posterior sternite gives rise to a low wall or walls, which mark the posterior and lateral boundaries of the thelycum. Frequently a gap is found between the anterior median plate and the lateral walls on either side of the plate. It is occupied by a special process arising from the coxal joint of the fourth pereiopod.

Comprised in the prawns with the asymmetrical petasma are a pretty large number of species, which are very closely related to one another, so that it is very difficult to distinguish them. On examination it has been revealed that they are divided into three distinct groups, each representing a new genus. Some principal characters of distinction between these three groups may be mentioned in the following synopsis:—

I. Anterior margin of petasma undivided ... *Leptopenaeus* n. g.
II. Anterior margin of petasma divided
  1. Right lobe of petasma broader than the left. No stridulating organ..... *Ceratopenaeus* n. g.
  2. Left lobe of petasma broader than the right. Stridulating organ present. *Erythropenaeus* n. g.

Leptopenaeus n. g.

Anterior margin of the petasma is entire, not divided. In the left lobe of the petasma the anterior internal piece is simple, or presents a faint transverse line of separation. In the thelycum the median plate is prominent, and close to it on each side, we find a narrow but very distinct wall. Inner antennular flagellum is nearly as long as, or longer than, the peduncle.

Penaeus philippinensis BATE, *Metapenaeus coniger* WOOD-MASON, *Penaeopsis sibogae* DE MAN, and *Metapenaeus distinctus* DE MAN belong to this genus. They inhabit a depth of 200 m. or more.

Ceratopenaeus n. g.

Left external piece of the petasma gives rise on the inner margin of its slender portion to digittate processes, often hidden by the right external piece which is broader and has the wavy surface. Left internal piece of the petasma looks as if it is distorted, undivided or partly divided obliquely near the posterior end. On the anterior margin of the median plate of the thelycum and at each lateral end of the posterior wall, we find a spine or a horn-like process. Lateral wall not distinct. Posterior wall broad, flattened in its median part. A pair of spines or low ridges are found in the hollow of the thelycum. Right internal petaloid part of the petasma flattened, more or less fan-shaped, and not granulated on its surface.

Parapenaeus dalei RATHBUN, and *Parapenaeus mogiensis* RATHBUN belong to this genus. *Penaeus lamellatus* DE HAAN and *Penaeopsis borradailei* DE MAN may be dealt with as aberrant forms of this genus.

Erythropenaeus n. g.

Petasma gives off many digittate processes on the anterior margin of both right and left external pieces, of which the left is broader and longer than the right. Posterior wall of the thelycum is nearly straight and low, and the hollow central part is more or less hairy. Coxal joint of the fourth pereiopod has a remarkable outgrowth over the thelycum. On the external margin of the outgrowth we find one or more rows of stiff hairs. Left internal piece of the petasma separated into three or four divisions. Stridulating organ is found at the posterior ventral corner of the carapace as a row of numerous small ridges.

Parapenaeus acclivis RATHBUN, *Parapenaeus akayebi* RATHBUN, etc. belong to this genus. The species of this genus are very difficult to distinguish from one another.